

# Hit Efficiency of the Pixel Detector

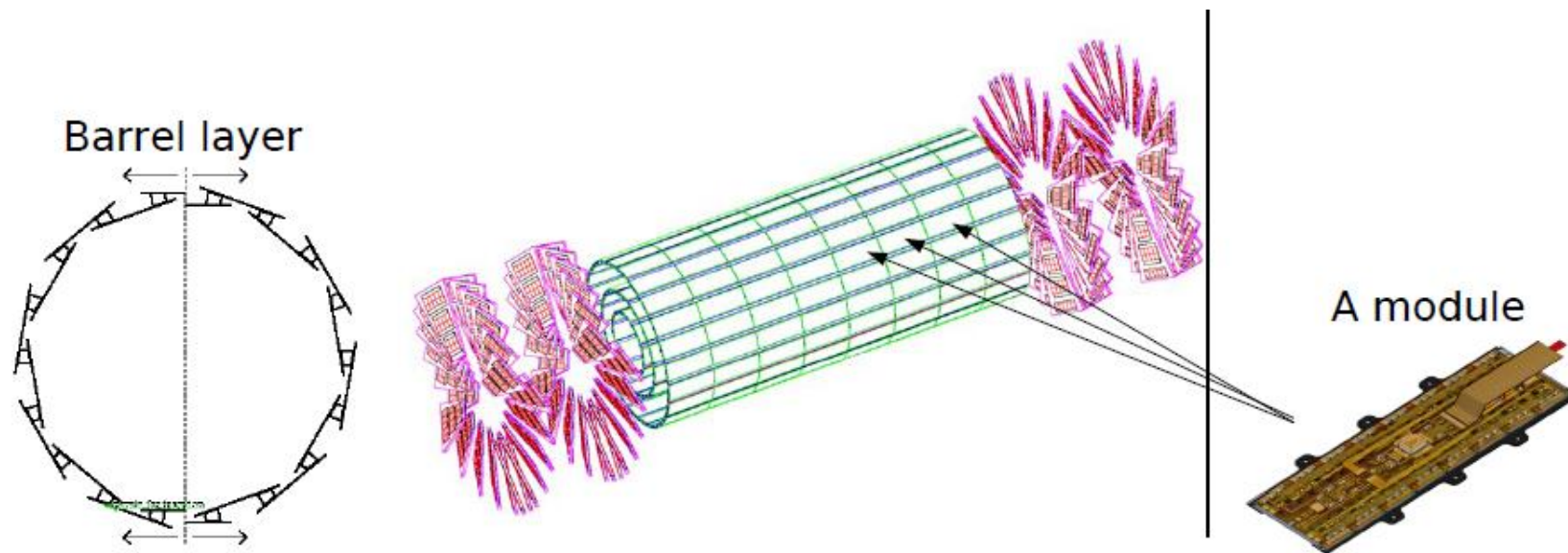
1

**János Karancsi (ATOMKI),  
Viktor Veszprémi (ATOMKI),  
Bálint Radics (KFKI RMKI)**

*(NKTH MB08-80137, OTKA NK81447)*

# Pixel detector components

2

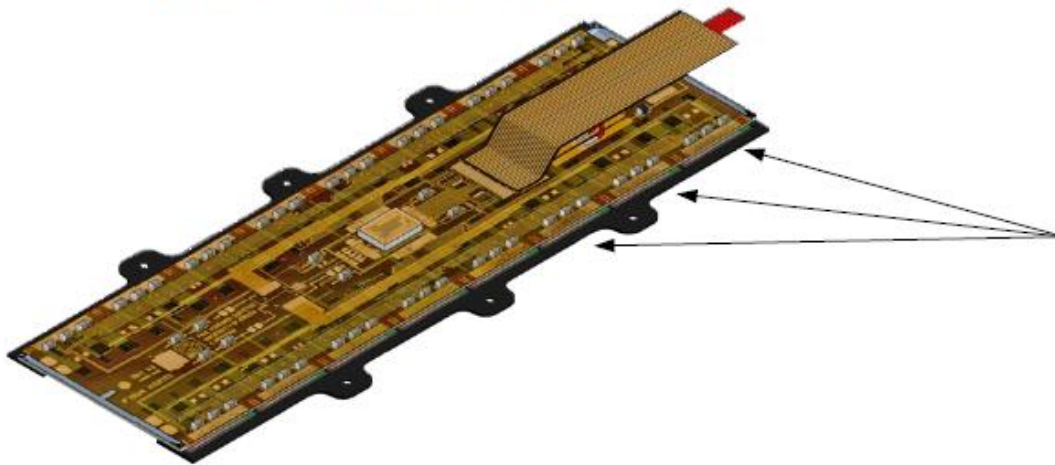


<http://grid.kfki.hu/twiki/bin/view/CMS/DetectorComponents>

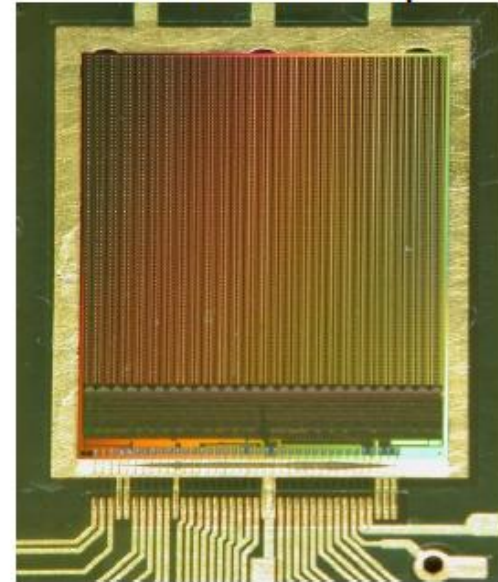
# Pixel detector components - Barrel

3

A module with 2x8 ROCs



Read Out Chip



- A ladder consists of 8 modules along the Barrel.
- A module has either 8 or 16 readout chips (ROC) arranged in a  $1 \times 8$  (for half-ladders) or  $2 \times 8$  (for full-ladders) configuration.
- A readout chip (ROC) is an array of  $80 \times 52$  pixels, each of size  $100 \mu\text{m} \times 150 \mu\text{m}$ .

# Definition of efficiency, valid hit condition

4

- RecHit Efficiency Definition:
  - $\text{Eff} = N_{\text{valid hits}} / (N_{\text{valid hits}} + N_{\text{missing hits}})$   
where both valid and missing hits come from track reconstruction
  - Layer 1 definition:  
 $\text{Eff} = N_{\text{valid propagated hits}} / (N_{\text{valid propagated hits}} + N_{\text{missing propagated hits}})$   
where hits are propagated from valid Layer 2 hits onto Layer 1
  - Considering missing hits with a cluster closer than  $500 \mu\text{m}$  valid
- Additionally, hits are required on the „other” layers or disks:
  - for Layer 1 : on Layer 2+3, Layer 2 + Disk 1, Disk 1 +2
  - Layer 2: Layer 1+3, Layer 1 + Disk 1
  - Layer 3: Layer 1+2
  - Disk 1 : Layer 1 +Disk 2, Layer 2 + Disk 2, will add *Layer 3 + Disk 2*
  - Disk 2: Layer 1 + Disk 1

# Run info

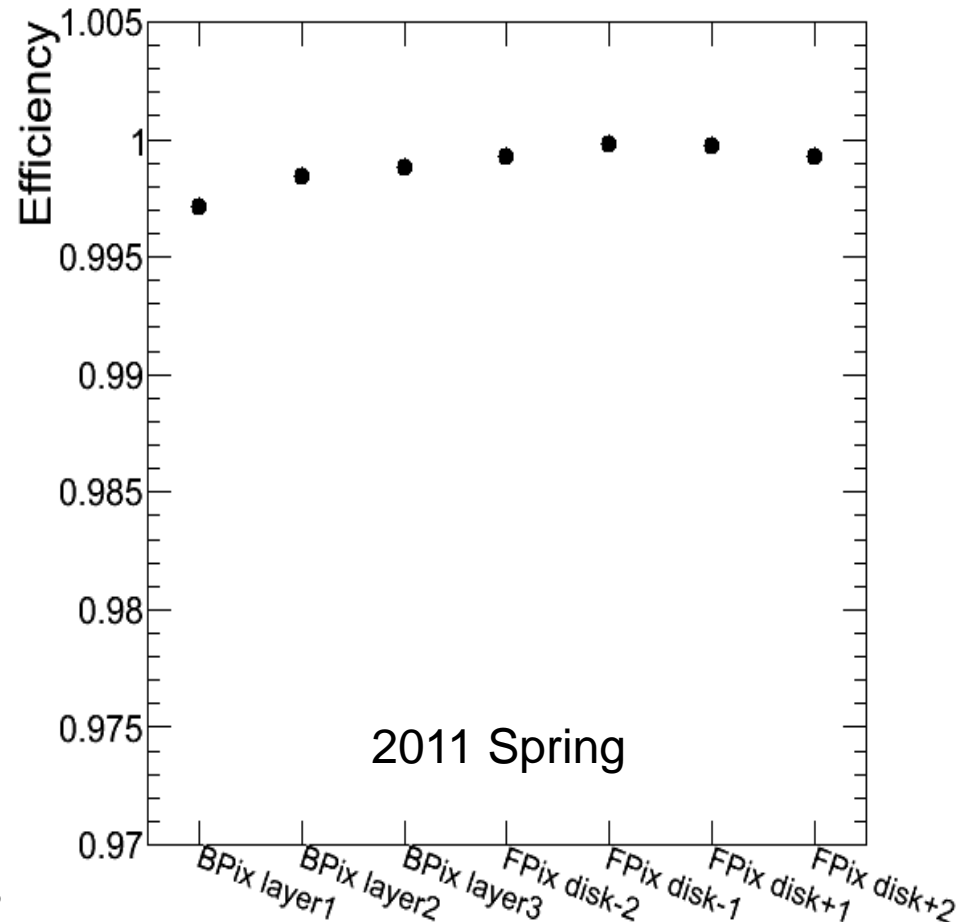
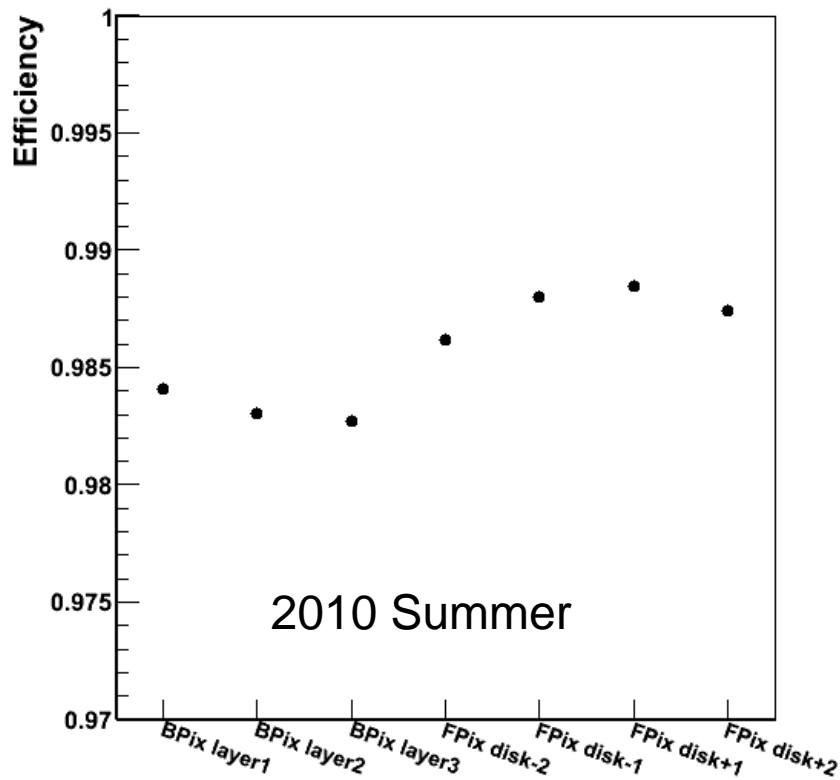
5

- Runs:
  - 160413,1 60578 – delay scans
  - 160431 – run with new default timing setting (WBC156\_p12ns) runs
- Datasets:
  - /MinimumBias/Run2011A-PromptReco-v1/RECO
- Software version: CMMSW\_4\_1\_2
- Global tag: GR\_R\_311\_V2
- Lumi selections:
  - All lumisections processed

# Overall detector Efficiency

6

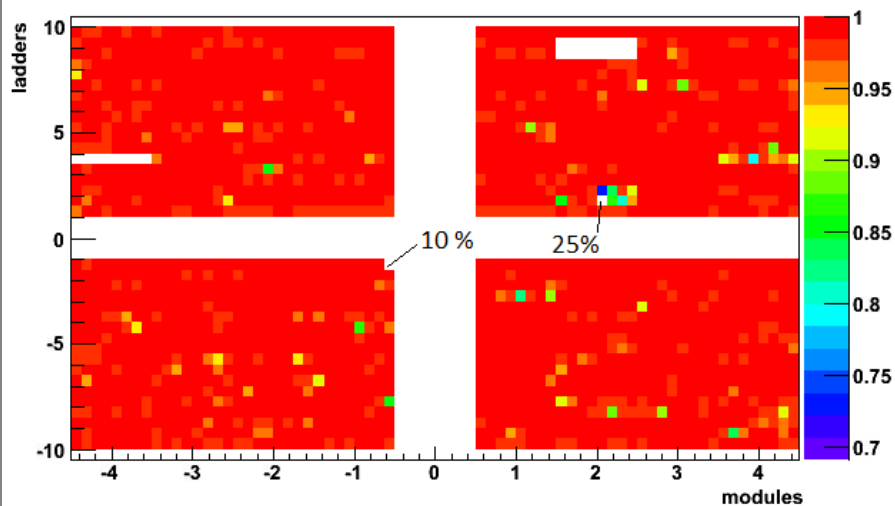
- Improvement in sensor efficiency calculation  
less dependence on tracking



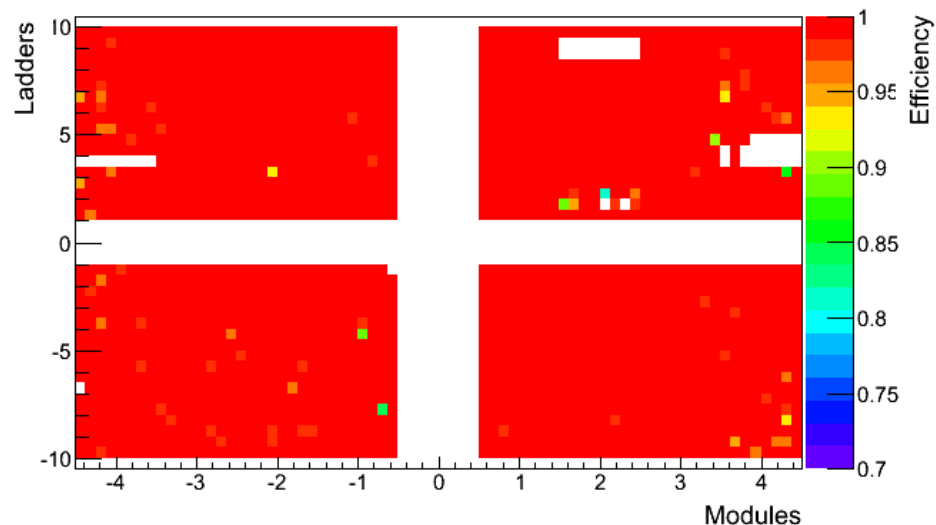
# BPix Layer 1 ROC Efficiency

7

- Ladder 4 module 4 out, some new bad ROCs



2010 Summer

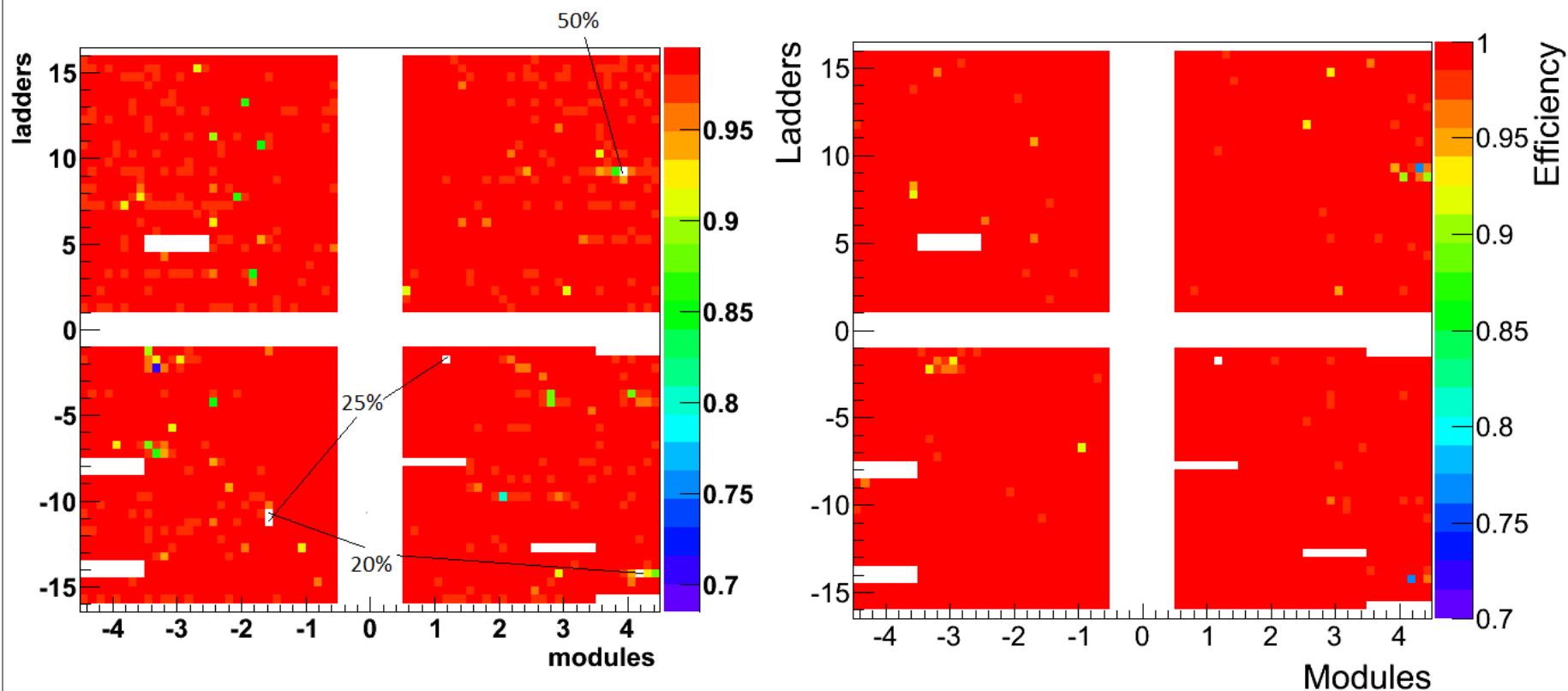


2011 Spring

# BPix Layer 2 ROC Efficiency

8

- Fewer low efficiency ROCs

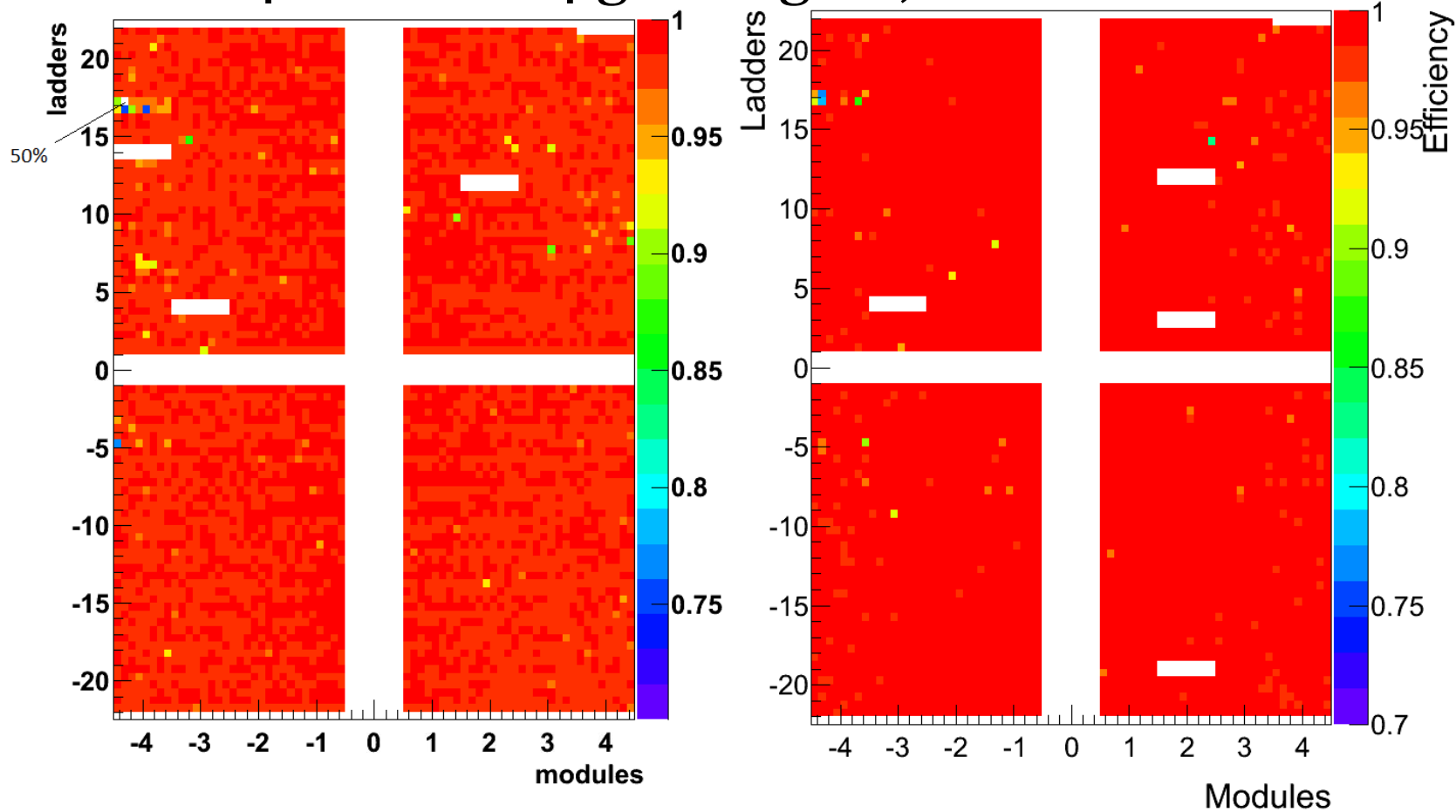




# BPix Layer 3 ROC Efficiency

9

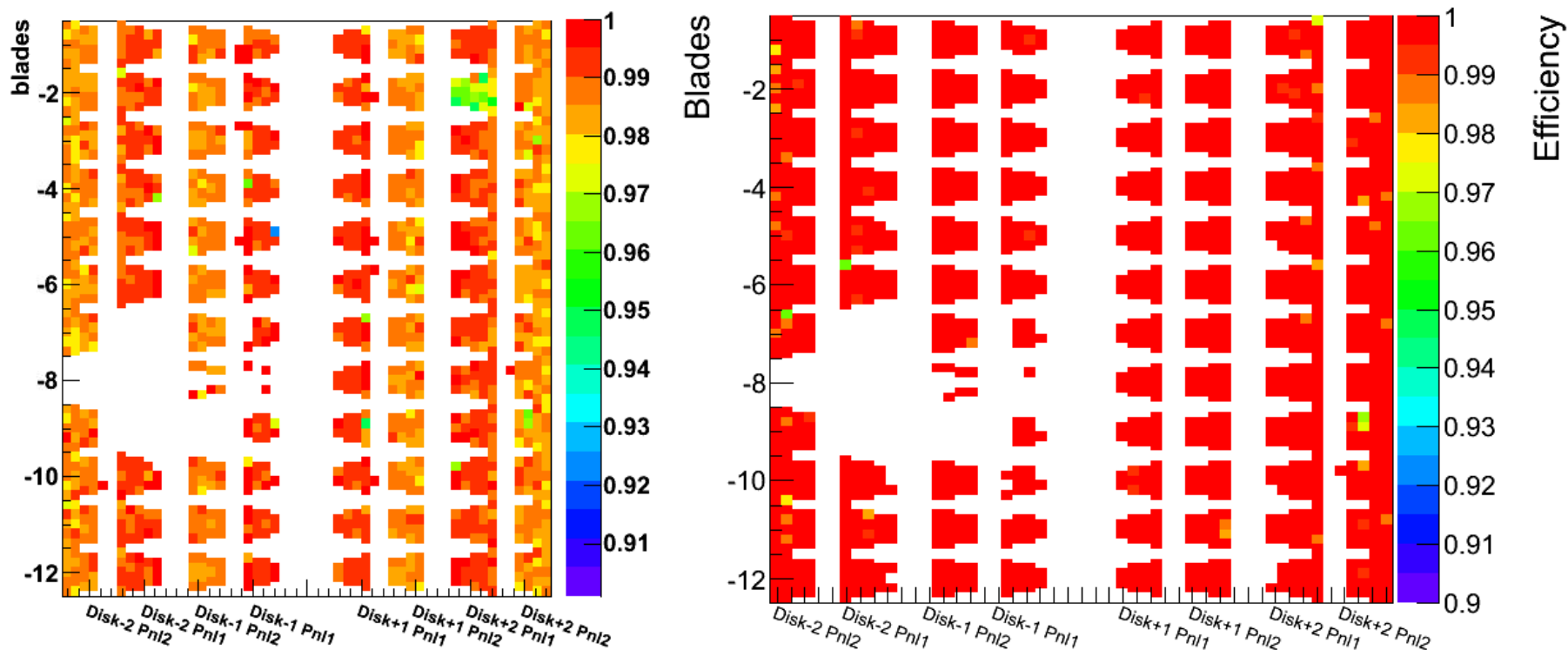
- Ladder 14 Module -4 good again, 2 new modules bad



# Fpix – BmO, BpO

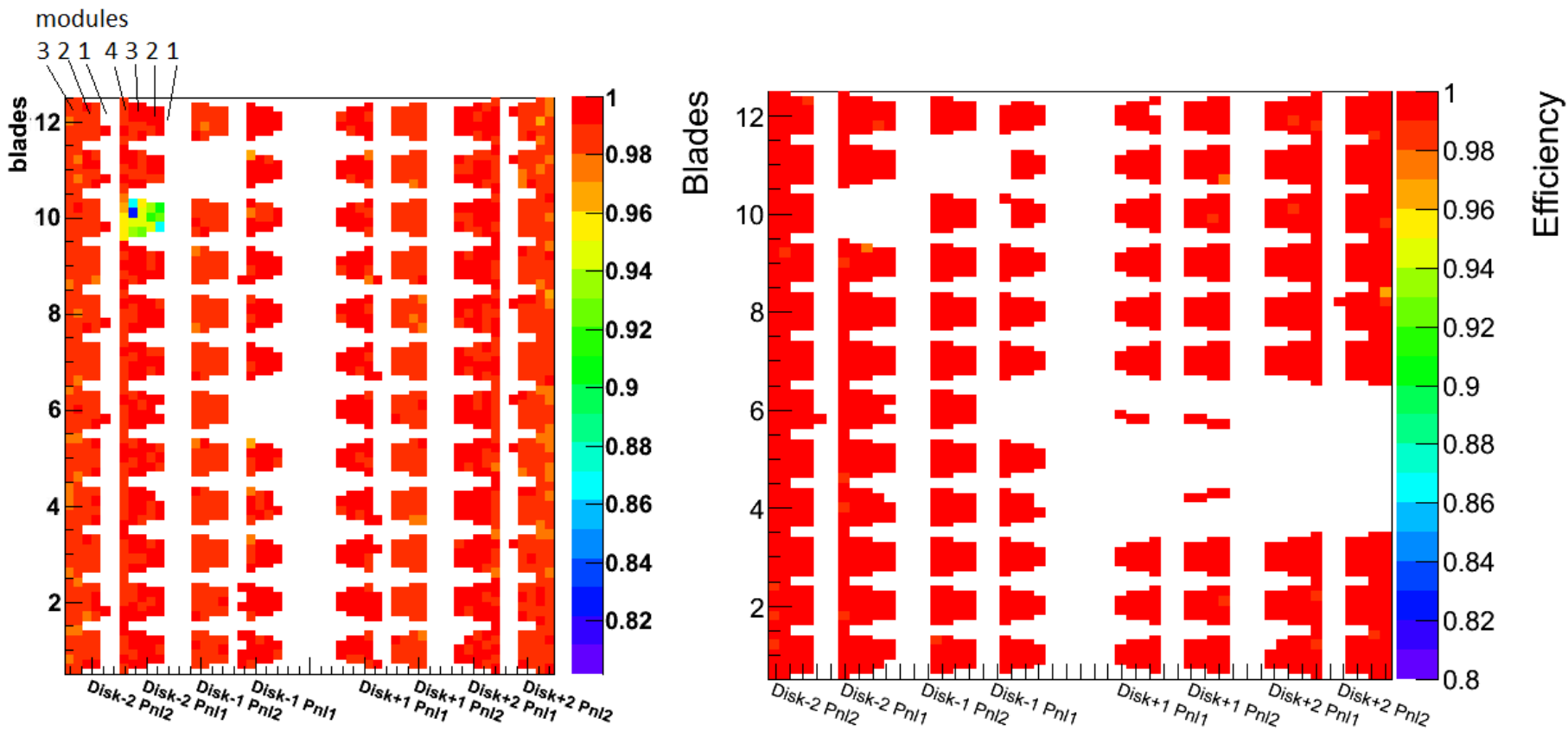
10

- Improvement on Disk+2 Blade -2 Panel 1



# Fpix – BmI, BpI

- 7 Panels out (problems with readout)



# Conclusions and Plans

12

## Conclusion

- Overall improvement in efficiency calculation

## Plans:

- Revise cuts
- Correcting new definition for eta dependence
- Seek approval of timing scan plots
- Further observe the impact of increasing luminosity and trigger rate